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Marwe coarctata, a Remarkable New Cyphophthalmid from a Limestone Cave in Kenya (Arachnida, Opiliones)

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ABSTRACT

A newly discovered cyphophthalmid opilionid from a cave in Kenya is the first member of the suborder from East Africa, and exhibits a combination of characters not known from any other species. It cannot be placed at this time in any of the described families of the suborder. The species seems to have affinities with the Sironidae, a Holarctic group. The families Sironidae and Pettalidae are thought to be sister groups making up the superfamily Sironoidea, and the species *Marwe coarctata,* described here as new, is perhaps the sister group of the two families.

INTRODUCTION

In 1980, I proposed a new classification of the Cyphophthalmi which recognized the existence of five families, rather than the traditional single family. The diagnoses of these families were satisfyingly unequivocal, and a cladistic analysis showed that they very likely represented monophyletic groups. At that time, only a single cyphophthalmid species defied easy placement in my scheme: *Troglosiro aelleni* Juberthie, described from a cave on the island of New Caledonia. As Juberthie (1979) noted in the original description, this animal exhibits a number of autapomorphies which led to the naming of a new genus, as well as some key synapomorphies which suggested placement in the Sironoidea, though not in the Gondwanan family Pettalidae.

Now a second species has come to light which represents a new generic group, and probably even a new family. It seems closest to the Sironoidea, but some key synapomorphies are not available, so that its position is difficult to assess. For this reason I am making no family assignment in the description of the new form, and in the absence of important data do not wish to describe a new family for it.

ACKNOWLEDGMENTS

I am grateful to Dr. Jesse C. Hillman of the New York Zoological Society for collecting the material reported on here, and for his correspondence on the biotope of the speci-

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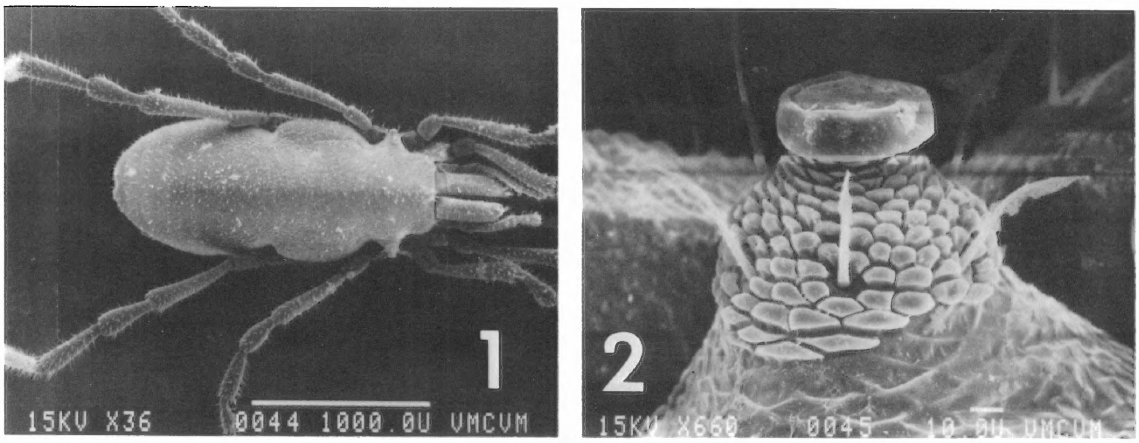


FIGS. 1, 2. Scanning electron micrographs. **1.** *Marwe coarctata* female, 36×. **2.** Right ozophore of the same specimen, 660×.

mens. The material was originally seen by Mr. Rod Crawford, University of Washington (Seattle) Museum, who, knowing of my longstanding interest in this group of opilionids, sent them on to me. I thank him also. I was able to take the scanning electron micrographs through the kindness of Dr. Brent Opell of Virginia Polytechnic Institute and State University, using the facilities of the Virginia/Maryland College of Veterinary Medicine. Mr. James C. Cokendolpher provided valuable comments on the manuscript.

Marwe, New Genus

TYPE SPECIES: *Marwe coarctata* Shear.

ETYMOLOGY: *Marwe* should be treated as feminine. The genus is named for a mythological heroine of the Chaga people, who visited the underworld and returned wealthy (Parrinder, 1967, p. 64).

DIAGNOSIS: The form of the body and the ozophores separate this genus from all other cyphophthalmids, and no other cyphophthalmids are known to occur in East Africa.

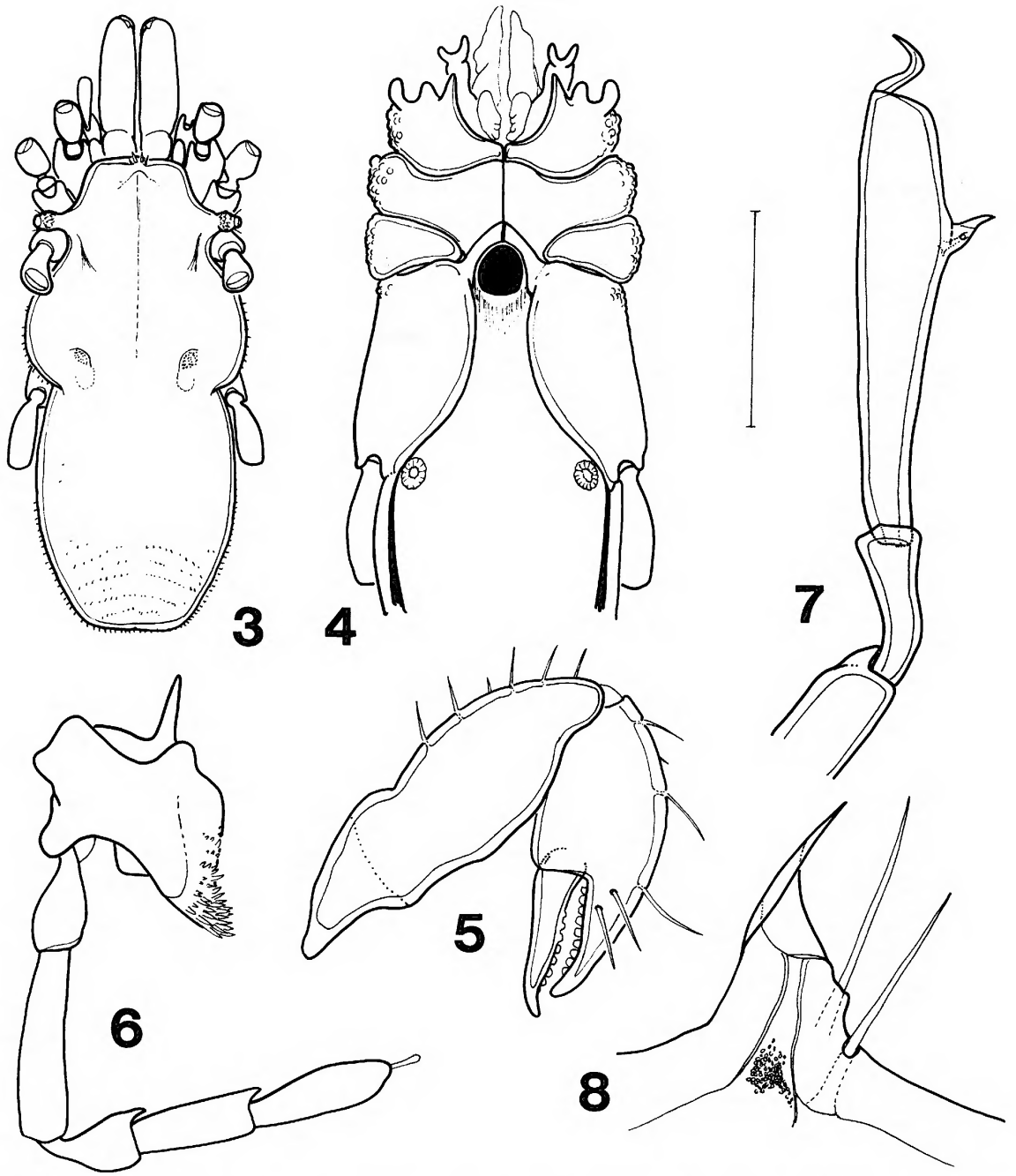
DESCRIPTION: Small, flattened, elongate cyphophthalmids with unusual body form (figs. 1, 3). Dorsal shield completely fused, abdominal segments indicated dorsally only by rows of small setae. Anterior (cephalic) part narrow, widest at ozophores. Middle (thoracic) part wider, separated from anterior part by constriction behind ozophores, broadly rounded, marked posteriorly by paired shallow depressions. Posterior (abdominal) part oval, separated from middle part by pronounced lateral constriction, abdominal segments indicated only on posterior half by faint grooves and transverse rows of setae. Ozophores (fig. 2) at cephalothorax margin (Juberthie's type I), directed laterally, bulbous, with prominent cuticular scales, lip of pore swollen, toroidal. Eyes absent. Anterior margin of scute broadly squared, not emarginate. Chelicerae robust, distal article about twice as long as broad, proximal article without dorsal crest, teeth uniform. Palpus typical of suborder, patella without ventral tooth. Leg coxae I and II broadly in contact in midline, endites poorly defined. Coxae III and IV separated by gonostome. Coxal elements not contributing to gonostome walls. Cuticle finely granulate, bearing scattered small, short setae. Abdominal segments ventrally fused, last three free. Sternites 8 and 9 and tergite 9 not fused as corona analis. Male posterior abdominal segments unmodified, no evidence of anal glands. Legs long, cuticle of legs smooth, relatively densely setose. Claws not toothed. Tarsus IV of male not divided, adenostyle closest to distal end, acuminate-laminate. Male genitalia unknown.

DISTRIBUTION: Kenya.

Marwe coarctata, new species

Figures 1–8

TYPES: Male holotype, two female paratypes, and two immature specimens from



FIGS. 3–8. *Marwe coarctata,* male. **3.** Body, dorsal view. **4.** Anterior part of body, ventral view. **5.** Right chelicera, lateral view. **6.** Right palpus, mesal view. **7.** Metatarsus and tarsus of right leg 4, lateral view. **8.** Adenostyle, mesal view. Scale line = 1 mm (fig. 3)., 0.6 mm (fig. 4), 0.35 mm (figs. 5, 6), 0.30 mm (fig. 7), 0.06 mm (fig. 8).

Cobra Cavern, Tiva River region, Tsavo East National Park, Kenya (March 9, 1974; J. C. and A. K. Hillman); holotype and a female paratype deposited in the American Museum of Natural History (AMNH), second female paratype prepared for scanning electron mi-

croscopy, mounted on stub and coated, retained by author, immature specimens collected with types deposited in AMNH.

ETYMOLOGY: The specific name is a Latin adjective meaning "narrow."

DIAGNOSIS: See diagnosis of the genus; this is the only species.

MALE: Total length 2.32 mm. Width across tips of ozophores 0.98 mm; greatest width 1.08 mm (measured across thoracic part of dorsal shield); length/width = 2.19. Dorsum as in figure 3, body long, narrow, extremely flat (estimated depth 0.2 mm), with distinct middorsal carina. Cuticle finely granulate, sparsely set with small setae forming regular transverse rows in posterior third. Color very pale yellow, internal organs clearly visible through scute. Frontal margin nearly square, gradually widening to bases of ozophores. Ozophores (fig. 2 shows ozophore of female, male is identical) at margins of scute, directed laterally, extending nearly 25 percent of body width at that point, slightly constricted at base, distal part bulbous, set with tight mosaic of raised cuticular polygons; bulbous portion with five setae evenly distributed around equator. Lip of pore swollen, resembling flattened disk with rounded edges; pore itself transverse, without operculum or plug. Middle section of scute almost disklike, broadly rounded at margins with pair of very shallow depressions near posterior limit; depressions marked with dark muscle insertions showing through cuticle. Body markedly constricted behind middle section, trochanters of fourth legs extending dorsad in notch produced by constriction. Abdomen oval, tergites only faintly indicated by fine transverse lines and rows of setae; posterior margin broadly squared, not emarginate or modified, without openings of anal glands.

Ventral thoracic complex (fig. 4): coxae I in contact in midline, endites not set off from bodies of coxae. Coxae II broadest mesally, in contact along midline for about three times distance of coxae I, endites not set off, coxae not forming part of gonostome wall. Coxae III separated by gonostome, lacking any obvious endites. Coxae IV enormously enlarged, three to four times longer than other coxae, rotated 90° posteriorly and appressed parallel to sides of body, so that legs IV are directed posteriorly. Endites of coxae IV not well marked, extending anterior to gonostome, in contact in midline. Gonostome nearly circular, obviously an extension of abdominal sternite 2, coxal endites not forming any part of margin. All sterna but last three fused without traces of sutures. Sternites 8 and 9 and tergite 9 all free, not fused to form corona analis, not modified in any way. Anal operculum oval, unmodified.

Chelicera (fig. 5) of robust type, basal article 0.52 mm long, 0.13 mm wide, without dorsal crest. Distal article 0.46 mm long, 0.16 mm wide; movable finger 0.2 mm long. Cheliceral teeth of one kind, blunt. Palpal trochanter without ventral process. Leg formula 1423. Cuticle of legs smooth, with scattered setae. Claws not toothed. Tarsus IV (fig. 7) 0.62 mm long, widest at adenostyle. Adenostyle (fig. 8) 0.39 mm from proximal end of tarsus, conical at base, extending beyond pore as thin, curved, triangular lamella with two subtending macrosetae.

Penis lost in dissection.

FEMALE: Total length 1.86 mm, greatest width 0.82 mm; width across ozophores 0.78 mm. Dorsum as described for male (fig. 1), but somewhat less broad in comparison to length (length/width = 2.26). Color darker than male, translucent lemon yellow. Ventral thoracic complex much as in male, except gonostome extends further anteriorly, obscuring endites of coxae IV. Other details of ventral surface as in male. Chelicera with basal article 0.52 mm long, 0.13 mm wide; distal article 0.52 mm long, 0.18 mm wide; movable cheliceral finger 0.18 mm long. Appendages as in male, but fourth tarsus unmodified. Ovipositor typical for suborder.

DISTRIBUTION: Known only from the type locality. According to the collector, Dr. Jesse C. Hillman, Cobra Cavern is Kenya's only "live" limestone cave, and has a relatively rich fauna. The opilionids were found in a shallow part of the cave in a root mat. The air in the cave is unusual in having a very high concentration of CO_2, so that explorers can stay inside for only a limited time. After the first collection was made, a repeat trip in 1983 yielded no more specimens, possibly because Dr. Hillman was unable to go personally, and was the only one who knew where the initial collection had been made. In 1982 and 1983, the Chyulu Hills lava caves were

explored, and Dr. Hillman thought he had collected more specimens of *Marwe*. But when I examined the raw collection (a jar containing part of a root mat), I found only a few small Acari. Because Dr. Hillman was uncertain about being able to return to the area, uncertainties which included concerns about Shifta bandits in the region, I decided, after having the specimens in my laboratory for more than three years, to describe them.

NOTES: The most striking thing about these animals on first examination is the remarkable body form—elongate, flattened, and with an outline different from any other cyphophthalmid. Undoubtedly the expanded disk-like portion of the dorsal shield is a corollary of the much enlarged fourth coxae (which are tightly appressed to the sides of the body) and as such probably consists only of the metapeltidial segment. The functional significance of this is unknown; in other genera the fourth coxae are the largest but usually form at most a 45° angle with each other. In *Marwe coarctata* the fourth coxae are nearly parallel. Perhaps the large, posteriorly directed coxae provide muscle power to enable the animals to push through the subterranean root mats they inhabit. Such a way of life would also be consistent with the flattened body and the prominent dorsal carina.

The two juvenile specimens collected with the three adults are in different instars, as inferred from their size and ventral structures. The largest is 1.7 mm long and seems to be a penultimate male, because there is a low swelling on the fourth tarsus where the adenostyle appears in adult males. The smaller specimen, 1.3 mm long, is one or two instars younger.

Characters of the penes of cyphophthalmid opilionids are important in placing them in the current classification. These organs are minute, and extracting them intact from the hard-bodied animals is difficult. During the dissection of the only male of *M. coarctata* available, the penis rose to the surface of the alcohol, was caught in the surface tension, and was lost. No amount of searching of the watch glass in which the dissection was made turned up this vital structure. Therefore I am missing some crucial data which might help clarify the relationships of this species.

Members of the infraorder Tropicophthalmi are egg-shaped. They have a body form which suggests synapomorphy because it shows a greater coalescence of the segments and tagmata. Attenuated chelicerae also serve as a synapormorphy for the Tropicophthalmi (Shear, 1980). Based on these two characters, *Marwe* cannot be grouped with them but instead seems closer to the Temperophthalmi. In the Temperophthalmi, the body is usually widest at the posterior of the thorax, and the thoracic part often appears expanded; two additional synapomorphies uniting members of this group are the presence of anal glands in the males and modifications of the male anal region, and the presence in the penis of a pair of movable fingers on either side of the orifice (Shear, 1980). *Marwe* is at the extreme in development of this body shape, though *Suzukielus sauteri* (Roewer) of Japan is remotely similar. However, other important synapomorphies are either lacking or cannot be observed in *Marwe*. *Marwe coarctata* appears to have no anal glands in the male, and the anal region is not modified. The penis remains unknown. If it has movable fingers, then the presence of anal glands may become a synapomorphy only for the superfamily Sironoidea and a coordinate superfamily and family may have to be erected for *Marwe*. If both movable fingers and anal glands are absent, the Temperophthalmi can be expanded to include the new genus (and probably new family and superfamily) by considering the body shape alone as a synapomorphy.

Another piece of the puzzle is the New Caledonian *Troglosiro aelleni* (Juberthie, 1979). This odd creature, as Juberthie suggested, is likewise close to the sironoids, but it lacks anal glands while having a penis with movable fingers. On the other hand, the body is egg-shaped. There seem to be no synapomorphies that I can discover (excluding possible features of the penis) uniting *Marwe* and *Troglosiro*. Given the present evidence, these biogeographically discordant taxa cannot be placed with any assurance in the system of Cyphophthalmi.

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